

REMARKS

This is in response to the Final Office Action mailed May 28, 2003. In the Office Action, PTO Form 326 indicated claims 1-20 were pending in the application and claims 1-20 were rejected. However, this appears to be in error because there are 25 claims in the pending application.

Claims 21-25 were added in an Amendment filed February 13, 2003. At page 2, the Examiner notes that the Amendment filed February 13, 2003, has been entered and made of record as paper no. 7. Further, at page 2 of the Office Action, the Examiner rejects claims 1-25. Because it appears the Examiner examined claims 1-25, this Amendment After Final assumes PTO Form 326 contained an error. As such, this Amendment After Final addresses the rejections of claims 1-25 given by the Examiner, rather than claims 1-20 indicated as rejected on Form 326.

Claim 1 was rejected under 35 U.S.C. § 103 as being unpatentable over Sato et al. The Examiner stated that Sato discloses a micro-electro-mechanical component formed of silicon comprising a feature on the component which is subjected to a mechanical stress and a couple of torsion bars operating as the elastic support portion of the feature. The Examiner concludes it would have been obvious to one of ordinary skill in the art that the torsion bars include means for increasing robustness of the feature. Further, in response to Applicant's previous arguments that Sato fails to show increasing the robustness of a micro-electro-mechanical component, the Examiner notes that the term robustness is not limited to less breakage and less contamination, but also means providing more strength, which is the purpose of the torsion bars in Sato et al.

Claim 1 is not rendered obvious by Sato et al. Claim 1 has been amended to clarify that the invention relates to a micro-electro-mechanical component formed of silicon comprising a feature on the component which is subject to a repeated mechanical stress. Further, the MEMS component comprises means for increasing robustness covering the feature and absorbing repeated stress to reduce breakage at the mechanical contact.

Any time the MEMS device is chipped or cracked, small amounts of silicon may contaminate the slider held in the MEMS device, or may later contaminate the disc or other electrical components near the MEMS device or slider. (P. 4, ll. 12-21.) Further, cracks may develop into more serious structural flaws. (Id.) To overcome this breakage problem of chips, breaks, or cracks, the ductile material is used to coat the MEMS device. (Id.) This armored coating serves to absorb

the stress of repeated contact and prevents the stress from being transferred through the ductile material to the silicon crystals so that the silicon fractures, breaks, or chips. (Id.)

Sato et al. does not teach or suggest the present invention. Rather, Sato teaches directly away from the present invention by teaching a method of eliminating contact with the test piece. Though Sato et al. recognizes that problem of silicon being a brittle material that can easily be destructed when it comes into contact with a mechanical force, such as a tensile tester (col. 1, ll. 41-48), Sato solves this problem by designing a test system which eliminates direct contact with the test piece (col. 1, ll. 60-63). Thus, Sato et al. does not teach increasing the robustness of the feature by reducing breakage at a mechanical contact, but rather teaches away from the present invention by teaching elimination of contact with the test piece all together.

The Examiner alternatively rejected claims 1-25 under 35 U.S.C. § 103 as being unpatentable over Hetrick et al. The Examiner stated that Hetrick discloses a micro-electro-mechanical component formed of silicon having a feature on the microcomponent which is subject to a mechanical stress, and a ductile material 42 coating the feature to prevent the sticking of the feature to the substrate. The Examiner concludes it would have been obvious to one of ordinary skill in the art that the ductile material increases robustness of the component. In response to the Applicant's argument that Hetrick does not render the invention obvious, the Examiner noted that the term robustness is not limited to less breakage and less contamination as had been argued by the Applicant. Means for increasing robustness also means providing more strength, such as the coated material in Hetrick does. Further, the Examiner notes that without the coating material, it would be obvious to one of ordinary skill in the art that Hetrick is less robust.

Claims 1-25 are not obvious in view of Hetrick. Claim 1 has been amended to clarify that the invention relates to a MEMS component formed of silicon comprising a feature on the MEMS component subjected to repeated mechanical stress and means for increasing robustness of the feature covering the feature and absorbing repeated stress to reduce breakage or chipping. Similarly, claim 6 has been amended to clarify the invention relates to a microcomponent formed of silicon, the microcomponent comprising a feature which is subjected to a mechanical stress and a ductile material coating the feature to increase robustness of the microcomponent and to absorb mechanical stress to reduce chipping or breaking near the feature which is experiences the

mechanical stress. Similarly, claim 12 has been amended to clarify that the invention relates to a method of increasing the robustness and absorbing mechanical stress on a MEMS component to reduce chipping or breaking of the MEMS component.

Hetrick et al. does not teach increasing the robustness of a MEMS component by reducing breakage. Rather, Hetrick discloses use of an amorphous hydrogenated carbon (AHC) coating on a micro-electro-mechanical structure to reduce the adhesive forces between microstructure surfaces. (Col. 3, ll. 3-11.) The preferred material for the AHC coating is Si-AHC. (Col 4, ll. 18-24.) This AHC coating is high hardness and has a high Young's Modulus, which also makes the coating a good material for mechanical structures of the MEMS. (Col. 3, ll. 47-55.) Hetrick states that the surface treatment of application of AHC is designed to create a hydrophobic surface, which reduces the adhesive forces between the microstructure surfaces by altering their surface properties (col. 3, ll. 3-6.) Hetrick goes on to note that in addition to the anti-adhesion properties of AHC, there are other benefits associated with using AHC in conjunction with a MEMS device. For instance, AHC as a protective coating reduces friction generated by moving parts (col. 3, ll. 33-35), reducing wear of MEMS moving parts (col. 3, ll. 42-43), prevents corrosion caused by humidity and other chemicals (col. 3, ll. 56-58), and lastly is a good insulator (col. 3, ll. 63-64).

Though Hetrick lists in detail a number of benefits resulting from coating a MEMS device with AHC, all the benefits relate to the high hardness of the AHC material. Hetrick does not include in its long list of benefits any discussion relating to the ability of AHC to increase robustness of the microcomponent or to absorb mechanical stress to reduce chipping or breaking near on the microcomponent. As such, Hetrick lacks any teaching of the present invention. Instead, Hetrick teaches away from the present invention by teaching the benefits of a high hardness coating.

Dependant claims 2-5, 7-11, and 13-20 depend from independent claims 1, 6, and 12 respectively. If an independent claim is non-obvious, then any claim depending therefrom is likewise non-obvious. *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). As such, dependent claims 2-5, 7-11, and 13-20 are not obvious in view of Hetrick.

Furthermore, dependant claims 2-5, 7, and 11 are not rendered obvious by Hetrick. Dependant claims 2, 4, and 11 claim a coating comprising a ductile material. Dependant claims 3,

5, 7-8, and 14-20 clarify that the ductile material is a metal. AHC is neither ductile nor a metal. As such, claims 2-5, 7-11, and 14-20 are not rendered obvious in view of Hetrick.

Further, Claims 21-25 are not rendered obvious by Hetrick. Claim 21 has been amended to clarify the invention relates to a MEMS component formed of silicon, the component comprising a feature on the MEMS component which is subject to a mechanical stress and a coating on the feature to increase the robustness thereof by covering the feature and absorbing repeated stress to reduce breakage or chipping, the coating comprising a ductile metal. As described above, Hetrick et al. does not teach or disclose a coating on a MEMS component which increases the robustness and absorbs repeated stress to reduce chipping or breakage. Further, Hetrick et al. does not teach or suggest coating a feature on the MEMS device with a ductile metal. As such, claims 21-25 are not rendered obvious by Hetrick.

None of the amendments above raise new matter or require the Examiner to conduct a further search. The amendments merely add to the claims features which were previously relied upon as rendering the invention non-obvious. Further, the amendments place the application in condition for allowance and should thus be entered.

Based on the above amendment and discussion, reconsideration and allowance of pending claims 1-25 is respectfully requested. The Commissioner is authorized to charge any additional fees associated with this paper or credit any overpayment to Deposit Account No. 11-0982. A duplicate copy of this communication is enclosed.

Respectfully submitted,

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Date: 7-28-03

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